CORED WIRE FOR INTRODUCING ADDITIVES INTO A MOLTEN METAL BATH

The invention relates to a cored wire for introducing additives into a molten metal bath.

Steels, irons, etc., are materials whose mechanical or other properties particularly depend on the complex composition of the material.

In order to obtain a material having certain properties from a basic composition, the content of certain elements is adjusted to obtain the desired composition.

It has been known for about twenty years to adjust the composition of molten material by introducing a cored wire of predetermined length into it.

This cored wire is constituted by a metallic casing containing the additive that one wishes to introduce into the molten bath.

The quantity of additive per meter being known, it is relatively simple to adjust the composition of the bath.

In the first cored wires produced, the metallic casing was simply folded so as to place the two edges of the formed strip side by side.

An inner sheet was first put in place in order to close the gap that remained between the edges of said strip, but this was not very effective given that this cored wire was subjected to a winding operation on a reel, then an unwinding operation during its utilization.

This solution was quickly replaced by a different closure for the strip.

This method consists of mechanically crimping the two edges of the strip.

More precisely, it consists of rolling the two edges together so that the edges are fastened to one another. This prevents losses of the additive contained in said strip.

This solution, which makes it possible to adjust a composition by introducing a cored wire into the molten material, works very well with most additives.

However, problems arise with certain additives such as calcium, magnesium, selenium, sulfur and others.

In essence, for some of these additives, the heat of the molten metal bath causes the cored wire to explode in an area very close to the surface of the bath.

Other additives vaporize very quickly and close to the surface.

This produces a strong surface reactivity, which results in an oxidation and/or renitriding of the bath, splashes of the liquid metal that damage the material, and heavy smoke emanation.

With these additives, this introduction operation is therefore much less efficient and the resulting safety conditions are not adapted for industrial utilization.

In an attempt to eliminate this problem, it is known to introduce the cored wire through a tube made of refractory material immersed in the bath.

The use of this tube is very difficult and very costly.

The object of the invention is to eliminate the aforementioned drawbacks.

It is known to cover this metallic sheath with a wrapping which, being combustible without leaving any harmful residues, momentarily retards the propagation of heat to the core of the cored wire.

The advantages are interesting.

This combustible wrapping is wound in a helix around the metallic sheath.

Unfortunately, the paper wrapping is sometimes observed to deteriorate during handling, i.e., when it is wound around the reel or when the wire placed on the reel is unwound in order to be introduced into the bath.

For this reason, the subject of the invention is a cored wire comprising a metallic sheath containing an additive, this sheath being characterized in that this metallic sheath is covered by a wrapping 7 which, being combustible without leaving any harmful residues, momentarily retards the propagation of heat to the core of the cored wire.

The invention will be better understood with the help of the following description given as a non-limiting example, in reference to the attached drawing, which schematically represents:

- Fig. 1: a cross-section of a cored wire according to the invention,
- Fig. 2: a step in the preparation of the cored wire,
- Fig. 3: an installation using a cored wire,
- Fig. 4: a cross-section of a variant of a cored wire.

Referring to the drawing, we see a cored wire 1 designed for the introduction of an additive into a bath 2 of molten material, such as a steel, an iron, or another material.

This molten bath is at a relatively high temperature, and is contained in a ladle 3.

In order to adjust the composition of the bath of molten material, this cored wire 1 is introduced into the bath at a predetermined speed.

The means of introduction 4 are conventional and will not be described in detail.

Conventionally, this cored wire comprises a metallic sheath 5 containing an additive 6.

This metallic sheath 5 is closed mechanically, which means that the edges of the strip are attached to one another, for example by rolling.

Advantageously, this metallic sheath is covered by a wrapping 7 which, being combustible without leaving any harmful residues, momentarily retards the propagation of heat to the core of the cored wire.

Harmful residues would include residues that affect the composition of the bath or produce inclusions that modify the behavior of the bath during casting.

Advantageously, the protective wrapping 7 is constituted by at least one layer 7A of paper rolled around the metallic sheath.

The paper 7A is a paper for so-called pyrotechnic applications.

This means that it is flame-resistant and has a thermal resistance coefficient higher than that of a sheet of ordinary paper.

This thermal protection is obtained:

- either by integrating the flame-retardant constituents into the composition of the paper,

- or by combining the paper layer and the adhesive used to attach the superposed strips to one another.

For example, there are known uncoated, wood-free, guaranteed flame-retardant M1 papers. This requires a material whose the flame propagation is nil, with no falling of burning drops and no flame persistence.

This wrapping has thermal insulation properties while being combustible.

Tests performed with one type of paper showed that:

- without a paper layer, the cored wire explodes after one second,

- with two layers, the cored wire explodes after one-and-a-half seconds, and

- with ten layers, the cored wire explodes after two-and-two-tenths seconds.

Thus, by adjusting the thickness of the wrapping and the speed at which the cored wire is introduced, it is possible to sufficiently retard either the explosion or the vaporization, and it is then easy to introduce the cored wire to a sufficient depth.

The layer or layers of the wrapping are advantageously constituted by one or more helical windings of a strip of paper.

These windings are for example crossed.

In a variant of embodiment, an external fixation of these layers is achieved by applying a layer of varnish, which must clearly be free from water or any substances that react violently with the material constituting the bath.

Therefore, a fixative layer is provided for the wrapping, especially when the latter is formed by several strips.

The width of the strip is preferably adapted to the diameter of the wire and to the conditions for utilization, and is for example between five and forty centimeters.

The thickness of the protective wrapping is therefore adapted to the user's needs (temperature of the bath and material to be injected).

Advantageously (Fig. 4), particularly in certain cases where the injection machine could damage the combustible wrapping, on top of this combustible wrapping 7, a protective metallic casing 10 encloses the assembly constituted by the additive, the metallic sheath and the combustible wrapping.

Said assembly is therefore covered by a protective metallic casing.

This protective metallic casing 10 prevents the combustible wrapping from being altered during the handling of the cored wire and forms, with the metallic sheath housing the additive and the combustible wrapping, a complex material that retards the melting of the assembly.

Advantageously, this protective metallic casing is constituted by a strip whose edges are crimped to form a tubular element.

This is the method normally used to form the metallic sheath housing the additives.

The shape of the crimp 11 is not illustrated.

This is the method that seems to be simplest to implement and that does not damage the combustible wrapping.

Advantageously, instead of applying the paper sheet in wound form, the paper sheet can be much thicker and can be applied at the same time as the protective metallic casing.

The edges of the thick sheet overlap.